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Authors
Debbink, KP
Tashjian, DB
Tirabassi, MV
et al.

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Case Report

Ureteric transection secondary to penetrating handlebar injury

K.P. Debbink [a,*], D.B. Tashjian [b], M.V. Tirabassi [b], R. Gaffey [a], J. Nahmias [a]

[a] Baystate Medical Center, Springfield, MA, United States
[b] Baystate Children's Hospital, Springfield, MA, United States

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ABSTRACT

Ureteric trauma is rare, occurring in <1% of all traumas. We present a unique case of a 13 year old female who sustained a penetrating abdominal injury from a bicycle handlebar. Upon initial examination there was herniation of bowel through the abdominal wound, so exploratory laparotomy was performed. A serosal injury of the colon and bleeding mesenteric veins were encountered; the retroperitoneum was not explored at that time. Postoperative course was remarkable for a doubling of the serum creatinine, increasing abdominal distention and pain. Computed tomography on postoperative day five demonstrated a large amount of intra-abdominal fluid. The patient was taken for re-exploration. The left ureter was found to be completely transected. It was repaired over a double-J stent. This case demonstrates the need for a high index of suspicion in the diagnosis of ureteric injury.
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Introduction

Penetrating abdominal trauma secondary to bicycle handlebars is rare. Most reports regarding handlebar injuries in the literature are related to traumatic abdominal wall hernias, solid organ injury, or bowel injury [1–4]. Likewise, ureteric injury related to external trauma is also rare, with even the busiest adult trauma centers typically seeing fewer than 10 cases per year [5]. We present a unique case of ureteric injury due to penetrating handlebar injury.

Details

An otherwise healthy 13 year old female presented to the trauma bay after a bicycle accident. Primary survey was within normal limits with vital signs appropriate for age and Glasgow Coma Score of 15. Secondary survey was remarkable for a deep 3 centimeter (cm) laceration in the left lower quadrant. There was active bleeding from the wound, with bowel herniating through a fascial defect. Given these findings the patient was brought to the operating room for exploration.

An exploratory laparotomy was performed via extension of the existing wound. The underlying fascial defect was found to be approximately 5 cm. A serosal tear on the sigmoid colon was identified and over-sewn. Venous bleeding from the base of the sigmoid mesentery was controlled with suture ligation. No further injuries were identified and no additional hemorrhage or fluid was noted. The complex abdominal wall injury was repaired primarily.

Routine admission urinalysis revealed microscopic hematuria, so computed tomography (CT) of the abdomen and pelvis with intravenous (IV) contrast was obtained post-operatively. No further traumatic injury was identified, however delayed images

* Corresponding author at: Baystate Medical Center, 759 Chestnut St, Springfield, MA 01199, United States.
E-mail address: kait.petros@gmail.com (K.P. Debbink).

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were not obtained. A cystogram was obtained which did not demonstrate injury to the bladder. The patient's postoperative course was notable for a doubling of the serum creatinine from 0.6 mg/dL (53.04 μmol/L) to 1.2 mg/dL (106.08 μmol/L). She also experienced ongoing abdominal pain, increasing distention and nausea. A retroperitoneal ultrasound was unremarkable except for large volume ascites. A non-contrast repeat CT of the abdomen and pelvis on postoperative day five demonstrated a large amount of ascites with a density of simple fluid.

The patient underwent repeat laparotomy. Upon entry to the abdomen three liters of fluid was drained, and intraoperative analysis revealed a fluid creatinine of 4.6 mg/dL (406.64 μmol/L). The left ureter was found to be transected near the middle third with the two ends approximately 2.5 cm apart. Ureterogram was performed via the transected ends to confirm anatomy (Fig. 1). Primary repair over a double-J stent was performed with 5-0 Vicryl and a drain left in place in the retroperitoneum.

Post-operatively the patient recovered well and was discharged five days later after the operative drain was removed. The double-J stent was removed at postoperative week six with concurrent cystoscopy and retrograde ureterogram demonstrating a normal ureter with no evidence of stricture.

Discussion

Most bicycle-related incidents described in the literature deal with head trauma. Handlebar injury is also an important mechanism of bicycle-related trauma, and the associated morbidity is underappreciated. Most cases described in the literature are secondary to blunt trauma. The most common injuries described include bowel perforation, solid organ injury, and traumatic abdominal wall hernia [1–4]. In a retrospective review by Nadler et al., 31% of children sustaining direct-impact handlebar injuries required operative intervention.

Ureteric injuries account for <1% of all urologic traumas [6], with the majority being a result of penetrating trauma. Table 1 data compiled from the National Trauma Database shows the varying mechanisms of ureteric injury [7]. The most common mechanism by far for injury to the ureter is gunshot wound. The diagnosis of ureteric injury is challenging and often delayed or missed. Urinalysis results are unreliable and highly variable. One case series found only 44% of patients with ureteric injury had hematuria on the initial admission urinalysis [8], and most studies demonstrate a rate of hematuria between 40 and 75% [6,9,10]. Imaging studies are also frequently unreliable. A retrospective review of traumatic ureteric injury by Medina et al. found that only 40% of patients with ureteric injury had positive findings on preoperative imaging studies [9]. Computed tomography is often used in trauma, however the timing of IV contrast utilized for most trauma evaluations does not adequately visualize the ureters [10]; delayed phase images must be included if there is any suspicion of ureteric injury. Cystoscopy with retrograde ureterogram/pyelogram is historically the most accurate way of identifying ureteric injury, but may not be feasible in a hemodynamically unstable trauma patient.

Due to a high rate of concomitant injuries many ureteric injuries are diagnosed intra-operatively during exploration for other reasons. This can pose a challenge for the surgeon as hemorrhage or spillage of intestinal contents can make detecting leakage of a small amount of urine difficult. Evidence of violation of the retroperitoneum should raise concern for possible ureteric injury. Approximately 60% of injuries occur in the proximal ureter [8]. The type of operative repair varies based on the location of the injury

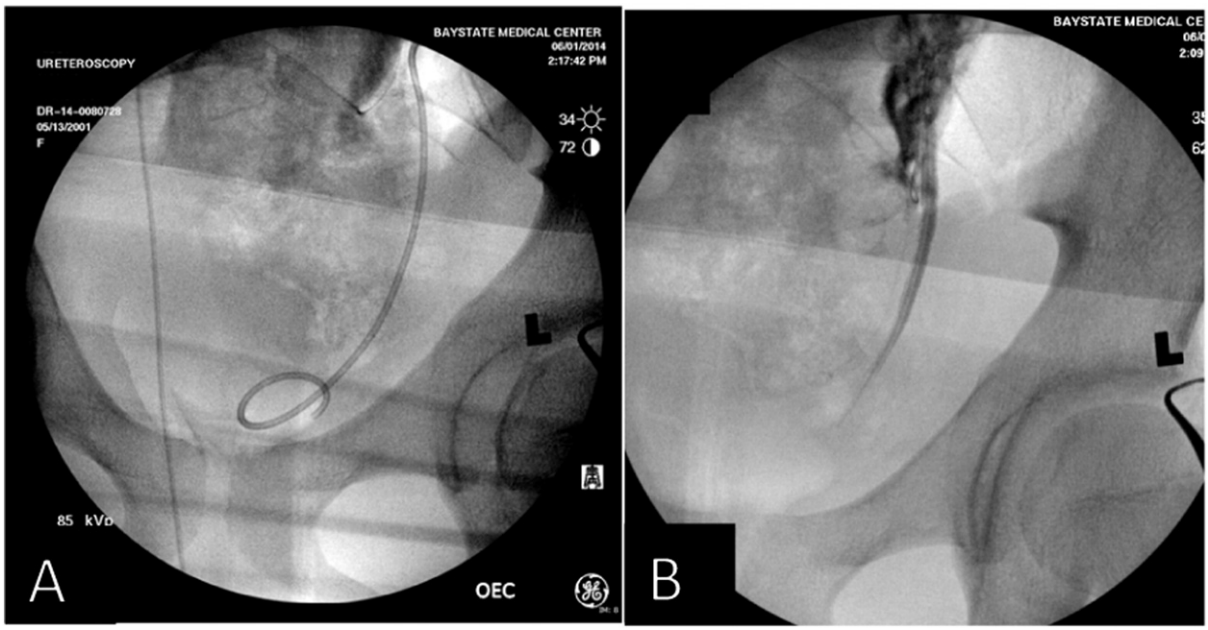

Fig. 1. Intraoperative ureterogram. (A) extravasation of contrast at mid portion of ureter. (B) Post-repair image showing placement of double J stent.

Table 1
Mechanism of ureteric injury.

	n	% of total cases
Blunt trauma	224	38
Motor vehicle collision	110	19
Pedestrian	25	4
Motorcyclist	18	3
High fall	15	3
Low fall	8	1
Cyclist	3	<1
Other	45	8
Penetrating trauma	358	62
Gunshot wound	316	54
Stab	29	5
Other	13	2

Table 2
Pertinent reconstructive options, based on location.

Upper third	Uretero-ureterostomy
	Ureteropyelostomy
Middle third	Uretero-ureterostomy
	Transuretero-ureterostomy
	Anterior wall bladder flap (Boari)
Lower third	Ureteroneocystostomy (direct reimplantation)
	Ureteroneocystostomy (psoas hitch)

(see Table 2) [8]. Regardless of the location of injury, the basic tenets of repair always involve debridement to healthy tissue and tension-free anastomosis over a stent with absorbable suture.

Conclusions

A high index of suspicion is necessary for timely diagnosis of ureteric injuries. Computed tomography imaging may be useful but must include delayed phase imaging to properly evaluate the ureters. Cystoscopy with retrograde ureterogram is the most reliable method of identifying a ureteric injury. Intra-operative discovery of retroperitoneal violation warrants further exploration, with identification of ureteric trauma prompting an appropriate repair based on the location of the injury.

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